



SWARNANDHRA COLLEGE OF ENGINEERING & TECHNOLOGY (AUTONOMOUS)

Accredited by National Board of Accreditation, AICTE, New Delhi, Accredited by
NAAC with "A" Grade – 3.32 CGPA, Recognized under 2(f) & 12(B) of UGC Act 1956,
Approved by AICTE, New Delhi, Permanent Affiliation to JNTUK, Kakinada
Seetharampuram, W.G.DT., Narsapur-534280, (Andhra Pradesh)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING TEACHING PLAN

Course Code	Course Title	Semester	Branches	Contact Periods /Week	Academic Year	Date of commencement of Semester
16EC7T01	MICROWAVE AND OPTICAL COMMUNICATIONS	VII	ECE	5	2021-22	04-10-2021

COURSE OUTCOMES

After completion of the course students are able to

1	Summarize about different types of modes in wave guides and how to decrease the transmission and power losses, different types of microwave solid state devices and their applications (K2)
2	Describe the knowledge about how these microwaves are generated transmitted, amplified and finally measured using Passive devices.(K1,K2)
3	Explain the fundamentals, advantages ,Ray theory transmission in Optical Communication and effect of dispersion of the signal, types of fiber materials, different losses in fibers (K2,K3,K4)
4	Observe the knowledge about Optical transmitters, receivers and estimation of link and power budget analysis. .(K1,K2)

UNIT	Out Comes / Bloom's Level	Topics No.	Topics/Activity	Text Book / Reference	Contact Hour	Delivery Method
UNIT-1: WAVEGUIDES						
I	CO1: Summarize about different types of modes in wave guides and how to decrease the transmission and power losses, different types of microwave solid state devices and their applications (K2)	1.1	Microwave Spectrum, Bands and Applications of Microwaves	T1, T2	1	Chalk & Talk, Smart Class, PPT Tutorial
		1.2	Rectangular Waveguides – TE/TM mode analysis	T1, T3	1	
		1.3	Expressions for Fields	T1, T3	1	
		1.4	Characteristic Equation and Cut-off Frequencies	T1, T3	1	
		1.5	Dominant and Degenerate Modes	T1, T3	1	
		1.6	Sketches of TE and TM mode fields in the cross-section	T1, T3	1	
		1.7	Mode Characteristics – Phase and Group Velocities	T1,T3, R1,R2	1	
		1.8	Wavelengths and Impedance Relations	T1,T3, R1,R2	1	
		1.9	Power Transmission and Power Losses in Rectangular wave guide	T1,T3, R1,R2	1	
		1.10	Impossibility of TEM mode.	T1, T3, T3 ,R2	1	
Total					10	



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		UNIT-2: MICROWAVE ACTIVE DEVICES				
II	CO2: Describe the knowledge about how these microwaves are generated transmitted, amplified and finally measured using Passive devices. (K1,K2)	2.1	Transferred Electron Devices: Gunn Diode-Principle, Two Valley Model Theory/RWH Theory,	T1, T2	2	Chalk & Talk, Smart Class, PPT Tutorial, & Case Study
		2.2	Characteristics and Modes of operation.	T1, T2	1	
		2.3	Avalanche Transit Time Devices: IMPATT Diode-Principle of Operation and Characteristics, related expressions	T1, T2	1	
		2.4	TRAPATT Diode- Principle of Operation and Characteristics, related expressions	T1, T2, R1	1	
		2.5	IMPATT Diode, TRAPATT Diode -Problems	T1, T2, R1	1	
		2.6	Two Cavity Klystron Amplifier – Power and Efficiency considerations	T1, T2, R1, R2	1	
		2.7	Reflex Klystron Oscillators – Modes and Efficiency considerations	T1, T2, R1, R2	1	
		2.8	Magnetrons	T1, T2, R1, R2	1	
		2.9	TWT	T1, T2	1	
		Total				
III	CO2: Describe the knowledge about how these microwaves are generated transmitted, amplified and finally measured using Passive devices.(K1,K2)	UNIT – 3: MICROWAVE PASSIVE DEVICES				
		3.1	Waveguide Corners, Bends, Twists,	T1, T3, R2	1	Chalk & Talk, PPT Tutorial, Smart Class
		3.2	Scattering Parameters and Matrix,	T1, T3		
		3.3	Scattering parameters of Wave Guide Tees: E-Plane	T1, T3, R2	1	
		3.4	H-Plane	T1, T2, R1, R2	1	
		3.5	E & H Plane	T1, T2, R1, R2	1	
		3.6	Hybrid Rings (Rat-Race)	T1, T2, R1, R2	1	
		3.7	Directional Coupler: Single hole	T1, T3, R2	2	
		3.8	Directional Coupler: Multi hole	T1, T3, R1, R2	2	
		3.9	Fixed and Variable	T1, T3, R2, R3	1	



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		Attenuators					
	3.10	Ferrite Devices: Gyrator,	T1,T3, R2,R3	1			
	3.11	Isolator	T1,T3, R2,R3	1			
	3.12	Circulator	T1,T3, R1,R2	1			
Total				13			
UNIT - 4 MICROWAVE MEASUREMENTS							
IV		CO2: Describe the knowledge about how these microwaves are generated transmitted, amplified and finally measured using Passive devices. (K1,K2)	4.1	Description Microwave Bench, Different Blocks and their Features, Precautions,	T1, T2.R1, R2	1	Chalk & Talk, PPT, Smart Class Tutorial, Active Learning & Case Study
			4.2	Frequency Meter	T2.R1	1	
			4.3	Slotted line section,	T2.R1	1	
			4.4	Measurement of Attenuation,	T2.R1	1	
			4.5	Measurement of Frequency	T1, T3.R1,	1	
			4.6	Measurement of Power,	T1, T3.R1, R2	1	
			4.7	Measurement of VSWR,	T1, T3.R1, R2	1	
			4.8	Measurement of Cavity Q	T1, T3.R1, R2	1	
			4.9	Measurement of Impedance.	T1, T3.R1, R2	1	
Total				9			
UNIT - 5: OPTICAL FIBERS AND DEVICES							
V		CO3: Explain the fundamentals, advantages, Ray theory transmission in Optical Communication and effect of dispersion of the signal, types of fiber materials, different losses in fibers (K2,K3,K4)	5.1	Propagation of light - Optical fiber structures,	T1, T3.R1, R2	1	Chalk & Talk, Smart Class, PPT Tutorial
			5.2	Acceptance angle, Numerical aperture, Attenuation,	T1, T2.R1, R2	1	
			5.3	Absorption losses	T1, T3.R1, R2	1	
			5.4	Scattering losses	T1, T3.R1,	1	



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				R2			
		5.5	Dispersion – Radiation losses	T1, T3.R1, R2	1		
		5.6	Splicing Technique	T1, T3.R1, R2	1		
		5.7	Optical Fiber connector,	T1, T3.R1, R2	1		
		5.8	Connector types	T1, T3.R1, R2	1		
		5.9	single mode fiber connector	T1, T3.R1, R2	1		
			Total		9		
		UNIT – 6 : OPTICAL NETWORKS					
	VI CO4: Observe knowledge about Optical transmitters, receivers and estimation of link and power budget analysis.(K1,K2)	6.1	Optical Source - LED, ILD characteristics.	T1, T3.R1, R2	1	Chalk & Talk, PPT Tutorial, Smart Class, Active Learning & Case Study	
		6.2	Optical detectors – PIN and APD characteristics.	T1, T3, T3,R1	1		
		6.3	Optical transmitters and receivers,	T1, T3, T3,R1, R2	1		
		6.4	System block diagram	T1, T3, T3,R1, R2	1		
		6.5	point to point link	T1, T2.R1, R2	1		
		6.6	link design	T1, T2.R1, R2	1		
		6.7	power budget analysis	T1, T2.R1, R2	1		
		6.8	WDM- DWDM	T2	2		
Content beyond Syllabus (if needed)	Applications of Microwave-Microwave Oven, Fundamentals of RF Engineering						
			Total		9		
		CUMULATIVE PROPOSED PERIODS				60	



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Text Books:

S.No.	AUTHORS, BOOK TITLE, EDITION, PUBLISHER, YEAR OF PUBLICATION
1.	Samuel Y. Liao, 'Microwave Devices and Circuits', PHI, 3 rd Edition, 1994.(UNITS-I&II).
2.	M.Kulkarni, 'Microwave and Radar Engineering', Umesh Publications 4 th Edition, 2010. (UNITS-II,III&IV)
3.	Gerd Keiser, "Optical Fiber Communications", the McGraw Hill Companies, 4 th Edition, 2008. (UNITS-V&VI)

Reference Books:

S.No.	AUTHORS, BOOK TITLE, EDITION, PUBLISHER, YEAR OF PUBLICATION
1.	Annapurna Das, Sisir K Das, "Microwave Engineering", 2nd edition, 2006, Tata McGraw Hill.
2.	John. M. Senior, "Optical Fiber Communications Principles and Practice", Second Edition, PHI, 1992.

Web Details

1.	https://www.microwaves101.com/encyclopedins/waveguide-primer
2.	http://www.tallguide.com/Waveguidelinearity.html
3.	https://www.tutorialspoint.com/microwave_engineering

	Name	Signature with Date
i. Faculty	Mr.C.K.L Rao	
ii. Faculty II (for common Course)	Mrs.M.Kanaka Durga	
iii. Course Coordinator	Mr.C.K.L Rao	
iv. Module Coordinator	Dr.B.Sadasiva Rao	
v. Programme Coordinator	Dr.B.S.Rao	

Principal